Department of Computer Science and Engineering

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SMART IOT BASED FISHERMAN BORDER ALERT SYSTEM

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ABSTRACT

The **Fisherman Border Alerting System** is an innovative IoT-based solution designed to prevent accidental maritime boundary crossings by fishermen. Utilizing an ESP32 microcontroller integrated with a GPS module, LED indicators, a buzzer, and an SOS push button, the system continuously tracks the boat's real-time location. As the fisherman approaches restricted or international waters, the device triggers multi-level alerts—starting with Stage 1 (initial warning), progressing to Stage 2 (critical alert), and finally Stage 3, where the SOS button can be pressed in emergencies. These alerts are conveyed through visual and audio signals, ensuring the fisherman is aware of the danger. The system can also send location data to Firebase for remote monitoring if internet access is available. Designed for low power consumption and offline operation, this system provides a low-cost, reliable, and scalable solution to enhance the safety of coastal fishermen and reduce international boundary violations.

Introduction

- Fishing is a vital livelihood for many coastal communities, but it often comes with the risk of unintentional border crossings into neighboring countries' maritime zones. Such incidents can lead to serious legal and diplomatic consequences, including the arrest of innocent fishermen. The lack of real-time location awareness and alert systems is a major cause of these issues. To address this problem, the **Fisherman Border Alerting System** is developed using IoT technology.

- This system integrates an ESP32 microcontroller with a GPS module, buzzer, LED, and SOS button to monitor the boat's location and issue timely alerts. The device is designed to notify the fisherman as they approach predefined boundary zones through multi-level alerts and allows them to send an emergency signal if needed. This project aims to enhance the safety of fishermen by providing an affordable, efficient, and easy-to-use solution for preventing accidental maritime boundary violations.

Problem Statement

Despite advancements in marine technology, many traditional fishermen still rely on basic navigation tools and are unaware of maritime boundary limits. This lack of real-time positional awareness often leads to **accidental border crossings**, resulting in **arrests, fines, or even imprisonment** by neighboring countries. The absence of an efficient alerting system, combined with poor communication infrastructure at sea, puts the safety and livelihood of fishermen at serious risk. There is a critical need for a **low-cost, reliable, and offline-capable solution** that can monitor the location of fishing vessels and provide timely alerts as they approach or cross international maritime boundaries. This project addresses the problem by developing an IoT-based alerting system that uses GPS technology and ESP32 to help fishermen stay within safe fishing zones and avoid unintended legal consequences.

Proposed Work

The proposed system aims to develop a compact, low-cost, and efficient IoT-based device that ensures the safety of fishermen by preventing unintentional maritime border crossings. The core of the system is built around the **ESP32 microcontroller**, which receives real-time location data from a **GPS module**. The system is programmed with predefined geofence coordinates marking the national maritime boundaries. When the fisherman approaches these zones, the system initiates a series of alerts:

- **Stage 1 Alert**: A soft warning using a buzzer and LED to indicate proximity to the border.
- **Stage 2 Alert**: A critical alert with intensified sound and flashing LED to warn that the fisherman is very close to or crossing the border.
- **Stage 3 (SOS Alert)**: A push-button-triggered emergency mode that allows the fisherman to manually alert authorities or send a location ping (optionally via **Firebase** if internet access is available).
- ☐ The device works in offline mode and can be powered using a battery or solar panel for extended sea operations. The proposed system is designed to be portable, rugged, and suitable for real-time marine conditions, offering a preventive safety measure to protect fishermen from legal troubles and ensuring peace of mind during their journey.
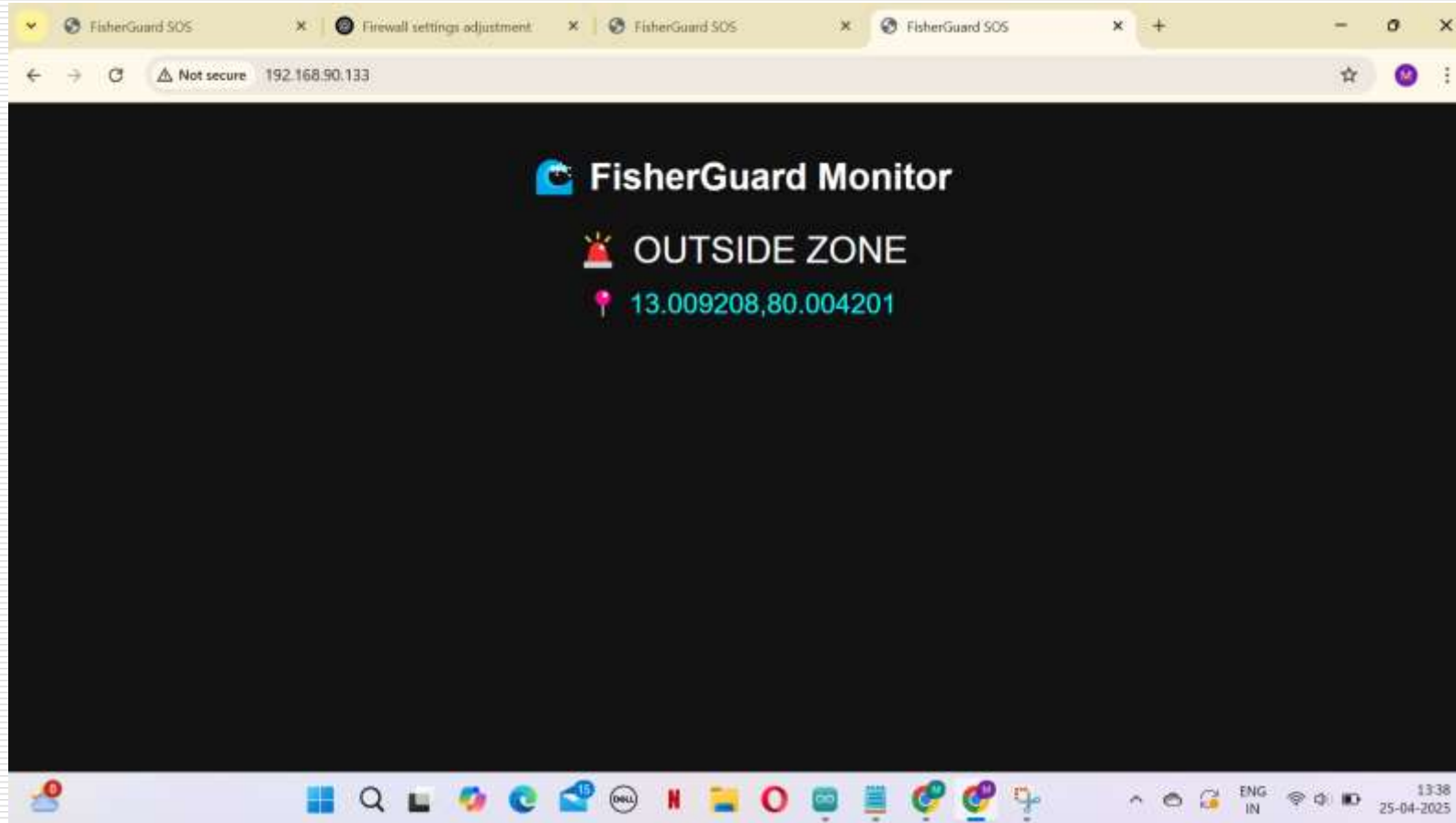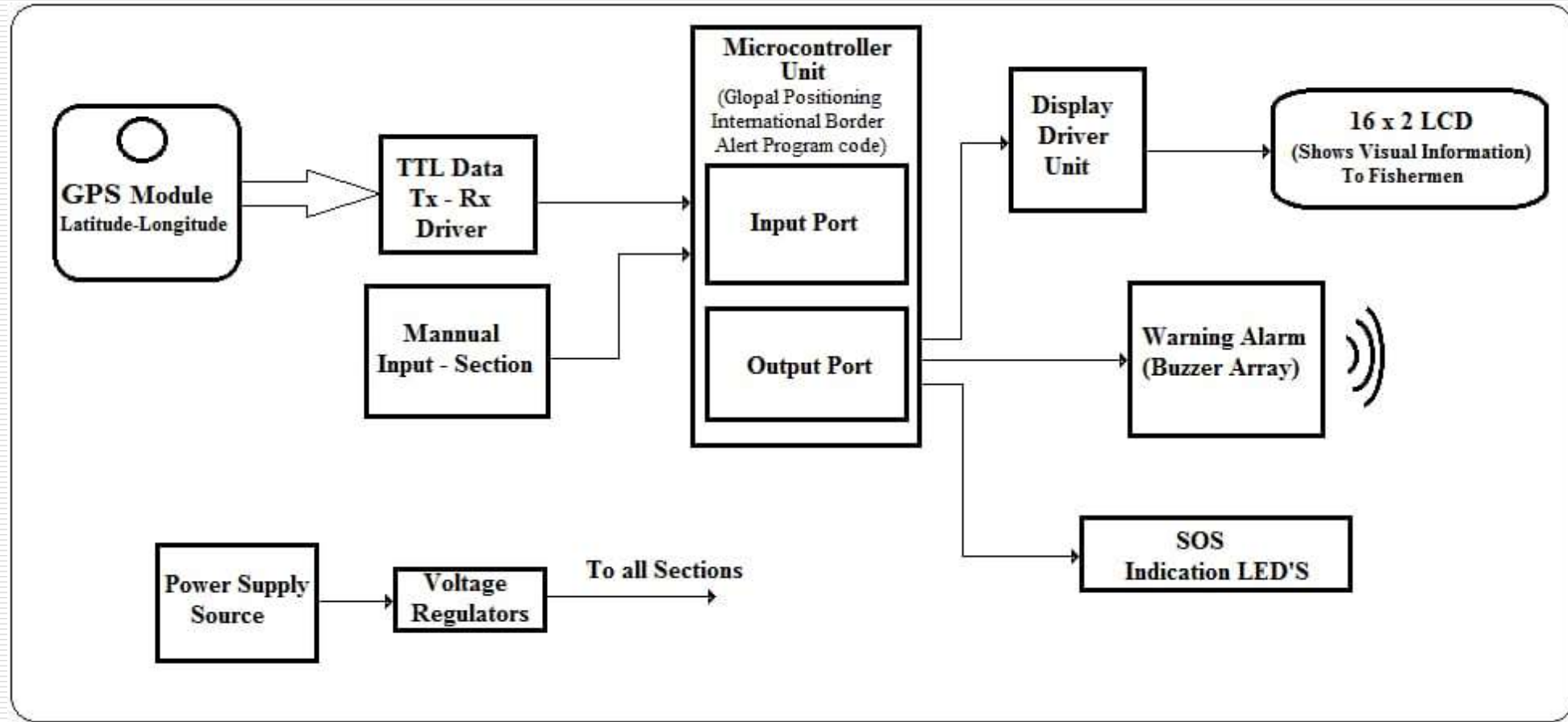
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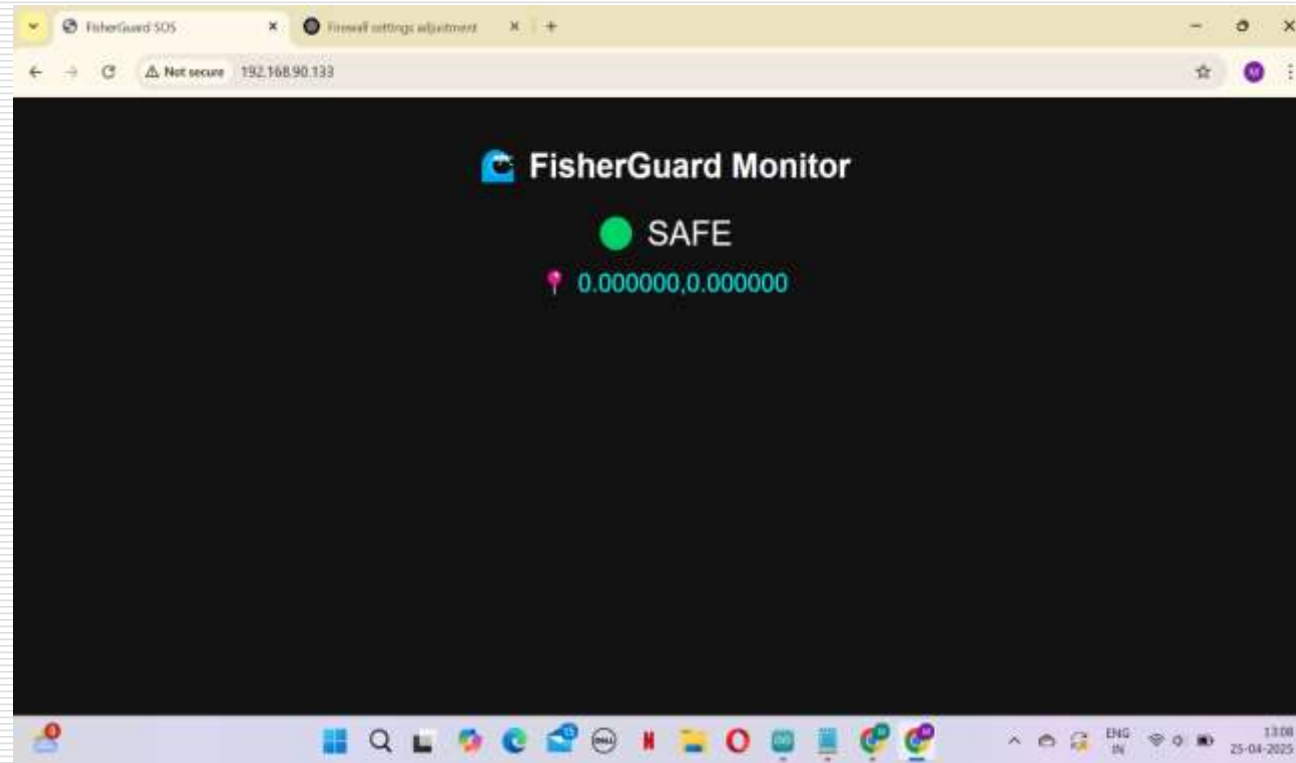
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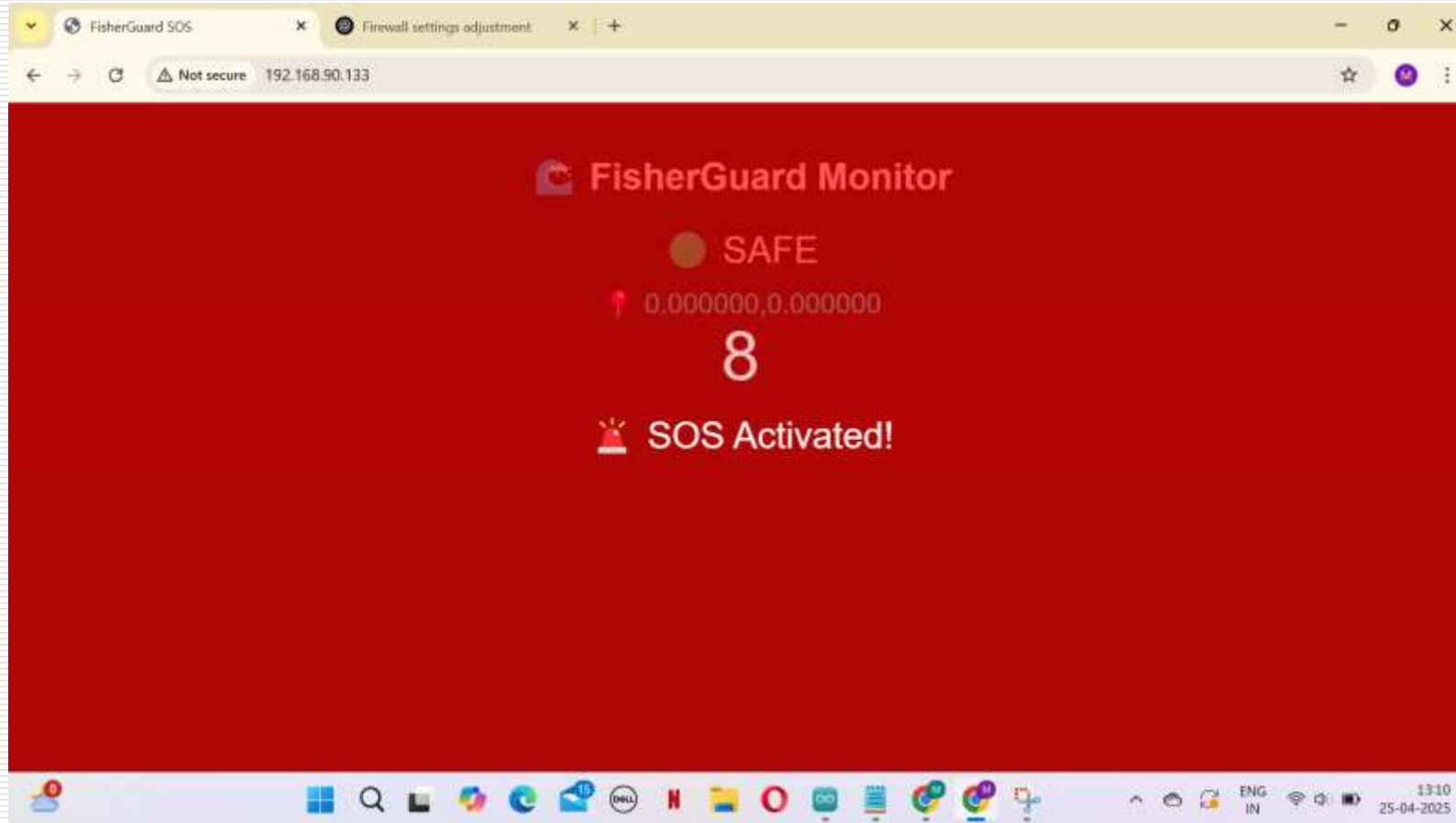
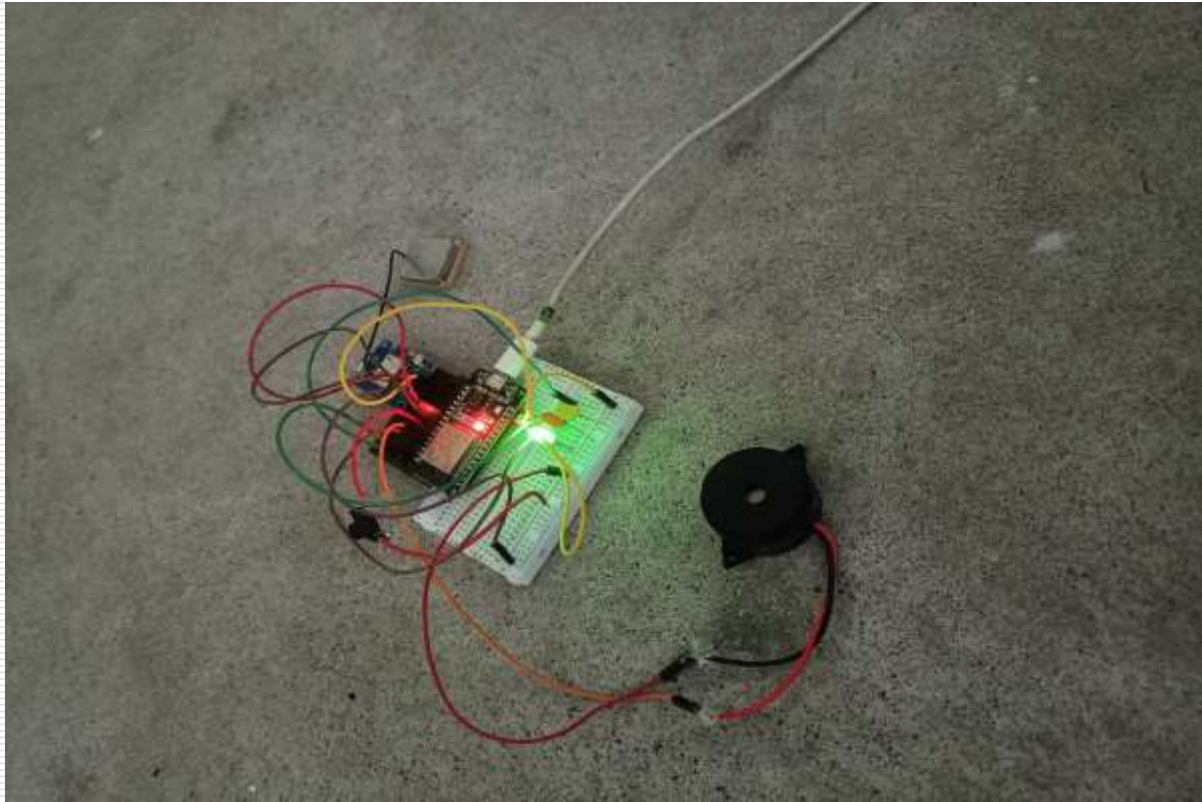# Implementation

Architecture

System requirements

- ☐ ESP32
- ☐ NEO 6M GPS MODULE
- ☐ SOS BUTTON
- ☐ BUZZER
- ☐ LED(Red , Yellow , Green)
- ☐ Jumper wires

Advantages of the proposed system

- ☐ Enhanced Safety for Fishermen.

- ☐ Real-Time Location Tracking

- ☐ Emergency SOS Functionality

- ☐ Cost-Effective and User-Friendly Design

- ☐ Integration with Cloud-Based Monitoring

- ☐ Scalability and Applicability

Real-Time Border Alert

Implementation

- GPS module continuously tracks boat's location.

- ESP32 compares location with **preset border coordinates**.

- If close to or crosses border, Activates **Buzzer and LED**.

- Sends **SMS Alert** via GSM module.

- Updates **Location to Cloud** (ThingSpeak/AWS).

- SOS Button triggers instant emergency SMS

Implementation of shoe

- ☐ TheGPS module provides **continuous latitude and longitude** every few seconds (typically 1s or 2s).

- ☐ Local alerts (Buzzer, LED) are **given first** before GSM SMS to immediately inform fishermen.

- ☐ Alerts fisherman locally even if GSM/cloud fails.

- ☐ **Safe Zone** is predefined using **latitude and longitude range**.

- ☐ **Threshold distance** (buffer zone) can be added for early warnings (optional)

Conclusion

The IoT-Based Fisherman Border Alert System effectively addresses the critical issue of fishermen inadvertently crossing international maritime boundaries, a problem that has led to legal consequences and loss of livelihoods. By integrating GPS technology with real-time location tracking, the system provides timely alerts through visual indicators and audible alarms, ensuring fishermen remain within national waters. This proactive approach not only safeguards the lives of fishermen but also fosters positive relations between neighboring countries by reducing border-related incidents. The system's affordability and ease of use make it accessible to fishermen, even in remote coastal areas, thereby contributing to their safety and well-being.

References

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Thank You